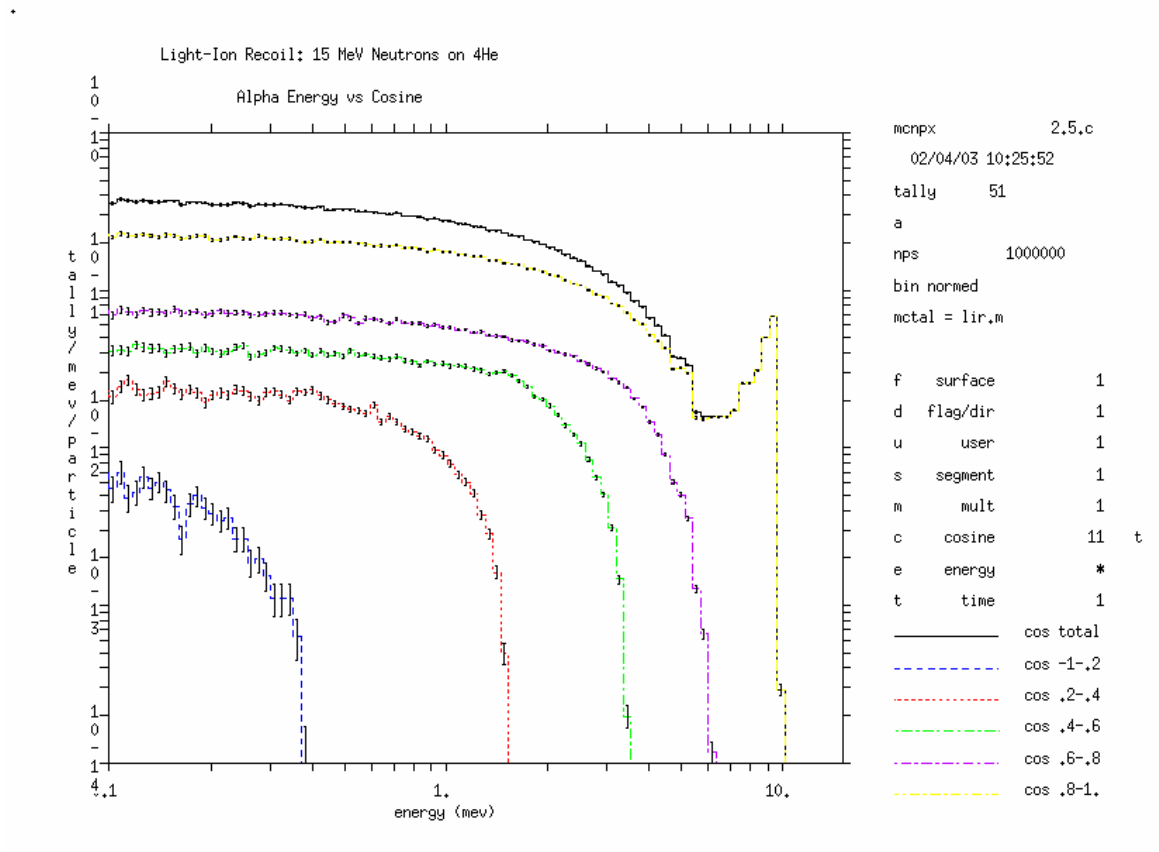
Light-Ion Recoil

MCNPX can produce and track ions created by elastic recoil from neutrons or protons. Neutrons and protons undergoing elastic scatter with light nuclei (H, D, T, ^{3}He, and ^{4}He) can create ions (protons, deuterons, tritons, ^{3}He, and α) that are banked for subsequent transport.

The following picture shows the energy-angle production of alphas created from 15-MeV neutrons striking ^{4}He. Note that in the forward bin, cosine $.8 < \mu < 1$, the α energy goes up to the theoretical maximum of 10 MeV.



The correct light-ion recoil capability is available in MCNPX2.5.c and later. The input file for this example is:

```
Test of light ion recoil
1  1 1e-5 -1
2  0       1

1 so 1.e-5

mode n a
imp:n,a 1 0
phys:n 6j 1
sdef erg=15
print -161 -162
tmp1 1e-20 0
```

```
fcl:n 1 0
m1 2004 .2
cut:a j 0
nps 1000000
f51:a 1
e51 .1 100log 20
c51 -.8 8i 1 t
fq51 e c
prdmp 2j 1
```

The plot commands are in the following plot command file.

```
rmct lir.m tal 51 xlim .1 15 loglog &
title 1 "Light-Ion Recoil: 15 MeV Neutrons on 4He" &
title 2 "Alpha Energy vs Cosine" &
fix c 11 label 1 "cos total" cop fix c 6 label 2 "cos -1-.2" &
cop fix c 7 label 3 "cos .2-.4" cop fix c 8 label 4 "cos .4-.6" &
cop fix c 9 label 5 "cos .6-.8" cop fix c 10 label 6 "cos .8-1."
pause
end
```